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## TECHNICAL MEMORANDUM

CH2MHILL

**Estimation of Potential Risk to Industrial Workers  
OMC Plant 2, Waukegan, Illinois  
WA No. 018-RICO-0528, Contract No. EP-S5-06-01**

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## Introduction

The purpose of this memorandum is to document the assumptions and results of estimating the potential risks to an industrial worker exposed to the contaminated surfaces existing in the Outboard Marine Corporation (OMC) Plant 2 building. This evaluation provides a supplemental exposure scenario to that presented in the *Remedial Investigation Report*<sup>1</sup>.

## Discussion

The human health risk assessment (HHRA) in the RI report evaluated potential human health risks specific to the building that were based on the current land-use scenario. This exposure scenario consisted of trespassers who might enter the OMC Plant 2 building and come into contact with the polychlorinated biphenyls (PCBs) at concentrations currently detected on the building surfaces. This exposure scenario was associated with an excess lifetime cancer risk (ELCR) of  $2 \times 10^{-5}$ .

This supplemental assessment evaluates the potential human health risk to industrial workers who are assumed to be exposed to the same contaminated surfaces and materials inside the plant as the trespassers. The objective of the evaluation is to estimate potential future risks if the PCB-contaminated materials within the plant are not addressed prior to use for industrial purposes.

The cumulative risk estimates presented in this memorandum are based on U.S. Environmental Protection Agency (USEPA) guidelines and are consistent with the methods and assumptions presented in Appendix E of the RI report, with the following modifications:

- **Exposure pathways and potentially exposed populations**—The contamination source is PCB-1248 (Aroclor-1248) on surfaces and materials inside the existing plant. The building, by its very nature, is ideally suited to industrial applications where, if used in this capacity again, workers could potentially be exposed to contaminated surfaces by

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<sup>1</sup> CH2M HILL. 2006. *Remedial Investigation Report, OMC Plant 2, Waukegan, Illinois*. April.

direct dermal contact, making them a valid receptor population with the potential for a completed exposure pathway.

- **Exposure assessment**— The exposure assessment used in this evaluation includes a frequency, duration and skin surface area that are consistent with a reasonable maximum exposure (RME) occupational scenario<sup>2</sup> including an exposure frequency of 250 days/year over a 25-year period, and a dermal surface area of 3,900 cm<sup>2</sup> <sup>3</sup>. The Exposure Point Concentrations (EPC) are presented in Table 1 and are the same as for the current-use trespasser evaluated in Appendix E and presented in Section 5 of the RI Report.

**TABLE 1**

Wipe Sample Results for Arochlor-1248  
 OMC Plant 2  
 Waukegan, IL

Surface	Number of Samples	Maximum Detected Concentration	Mean	Standard Deviation	EPC	Units
Non-porous	62	600	104	119	134	ug/100cm2
Porous	63	750	48.1	134	216	ug/100cm2
Combined	125	750	75.7	130	97.7	ug/100cm2

The exposure assumptions and the toxicity values for PCB-1248 are shown in Tables 2 and 3, respectively.

<sup>2</sup> OSWER Directive 9285.6-03, 1991. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual Supplemental Guidance. Standard Exposure Factors.

<sup>3</sup> This represents hands and arms for an adult male, at the 50th percentile. U.S. EPA. Exposure Factors Handbook, 1997.

**TABLE 2**

Exposure Assumptions and Parameters for Estimating Cancer Risk from Contact with Contaminated Surfaces  
 OMC Plant 2  
 Waukegan, IL

Pathway		Exposure Parameters								Summary Intake Factor
Media	Exposure Route	Skin Surface Area (cm <sup>2</sup> )	Exposure Frequency (d/yr)	Exposure Duration (yr)	Number of Contacts per Day (d <sup>-1</sup> )	Body Weight (kg)	Fraction Transferred to Skin	Conversion Factors (mg/ug)	Averaging Time (yr x d/yr)	(cm <sup>2</sup> *mg)/(kg*ug*d)
Surface - Trespass	Dermal	420	99 <sup>a</sup>	7	1	70	0.5	1.00E-03	70 x 365	8.1E-05 x ABS
Surface - Occupational	Dermal	3900 <sup>a</sup>	250 <sup>c</sup>	25 <sup>c</sup>	1	70	0.5	1.00E-03	70 x 365	6.8E-03 x ABS

<sup>a</sup> Hands and arms, adult male, 50th percentile. U.S. EPA. Exposure Factors Handbook, 1997.

<sup>b</sup> Exposure frequency is 50% of the average (1971-2000) number of days during April through October with minimum temperatures higher than 32 degrees Fahrenheit at climate station 19029 WAUKEGAN 2 WNW, IL. ([http://mrcc.sws.uiuc.edu/climate\\_midwest/historical/grow/il/19029\\_gsum.html](http://mrcc.sws.uiuc.edu/climate_midwest/historical/grow/il/19029_gsum.html)).

<sup>c</sup> OSWER Directive 9285.6-03, 1991 Risk Assessment Guidance for Superfund, Vol. 1 Human Health Evaluation Manual, Supplemental Guidance.

**TABLE 3**

Toxicological Information for Aroclor-1248  
 OMC Plant 2  
 Waukegan, IL

Chemical	Oral Slope Factor <sup>a</sup> (mg/kg-day) <sup>-1</sup>	Dermal Absorption Factor <sup>b</sup>
Aroclor-1248	2	0.14

<sup>a</sup> from Iris 11/14/05

<sup>b</sup> from EPA 2004. Risk Assessment Guidance for Superfund Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment). Exhibit 3-4 Recommended Dermal Absorption Fraction from Soil

## Risk Assessment Results

The exposure pathway was assumed to be associated with an industrial worker who could have dermal contact with PCB-contaminated surfaces and materials while working in the existing plant building.

Risk-based values and human health risks were calculated using the processes described in Appendix E of the RI Report with the frequency, duration, and skin surface area adjusted for an industrial worker.

### Comparison of Wipe Sample EPCs to Remediation Objectives

The EPC for combined porous and nonporous surfaces was 97.7 micrograms ( $\mu\text{g}$ )/100  $\text{cm}^2$ . This number was compared to the risk-based values which correspond to ELCR of  $1 \times 10^{-6}$  and  $1 \times 10^{-4}$ . Table 4 shows that the EPCs exceed risk-based remediation objectives for this range of carcinogenic risks.

**TABLE 4**

Comparison of Wipe Sample EPCs for Arochlor-1248 to Remediation Objectives  
 OMC Plant 2  
 Waukegan, IL

Chemical	Exposure Scenario	Calculation of Intake Factors per Unit Concentration ( $\text{cm}^2 \cdot \text{mg} / (\text{kg} \cdot \text{ug} \cdot \text{d})$ )	Cancer Risk Level	Remediation Objective for Surfaces Based on Cancer Risks		Wipe Sample EPCs for Arochlor-1248 ( $\text{ug}/100 \text{ cm}^2$ )			EPCs exceed Remediation Objective?
				( $\text{ug}/\text{cm}^2$ )	( $\text{ug}/100 \text{ cm}^2$ )	Non-Porous (bare metal)	Porous (painted surfaces, concrete, etc.)	Combined (Porous and Non-Porous)	
Aroclor-1248	Trespasser - Dermal	1.14E-05	1E-06	0.044	4.4	134.3	216.4	97.7	Yes
Aroclor-1248	Occupational - Dermal	9.54E-04	1E-04	0.052	5.2				Yes
Aroclor-1248	Occupational - Dermal	9.54E-04	1E-06	0.001	0.1				Yes

### Calculation of RME Chemical Cancer Risks for Porous and Non-Porous Surfaces – Industrial Worker

The ELCR associated with potential contact with contaminated surfaces and materials by industrial workers inside the existing plant building is  $2 \times 10^{-3}$ . Intake and carcinogenic risk are summarized in Table 5.

**TABLE 5**

Calculation of RME Chemical Cancer Risks for Porous and Non-Porous Surfaces -  
 Occupational (Factory Worker) Scenario  
 OMC Plant 2  
 Waukegan, IL

Chemical	CAS	Wipe Sample Exposure Point Concentration (ug/100 cm <sup>2</sup> )	Dermal Slope Factor (SF) (kg- day/mg)	ABS Unitless	Carcinogenic		
					Estimated Dermal Intake (cm <sup>2</sup> *mg)/(kg *ug*d)	Dermal ELCR (Intake * SF)	Excess Cancer Risk (Intake * SF)
PCB-1248 (Aroclor 1248): Trespass	12672-29-6	9.77E+01	2.0E+00	1.4E-01	8.1E-05	2.3E-05	2E-05
PCB-1248 (Aroclor 1248): Occupational	12672-29-6	9.77E+01	2.0E+00	1.4E-01	6.8E-03	1.9E-03	2E-03

Notes:

Wipe sample results provided for combined interior non-porous wipe samples (bare metal) and interior porous wipe samples (painted surfaces, concrete, etc.).